Calculus 1 Workbook

Formal definition of the limit

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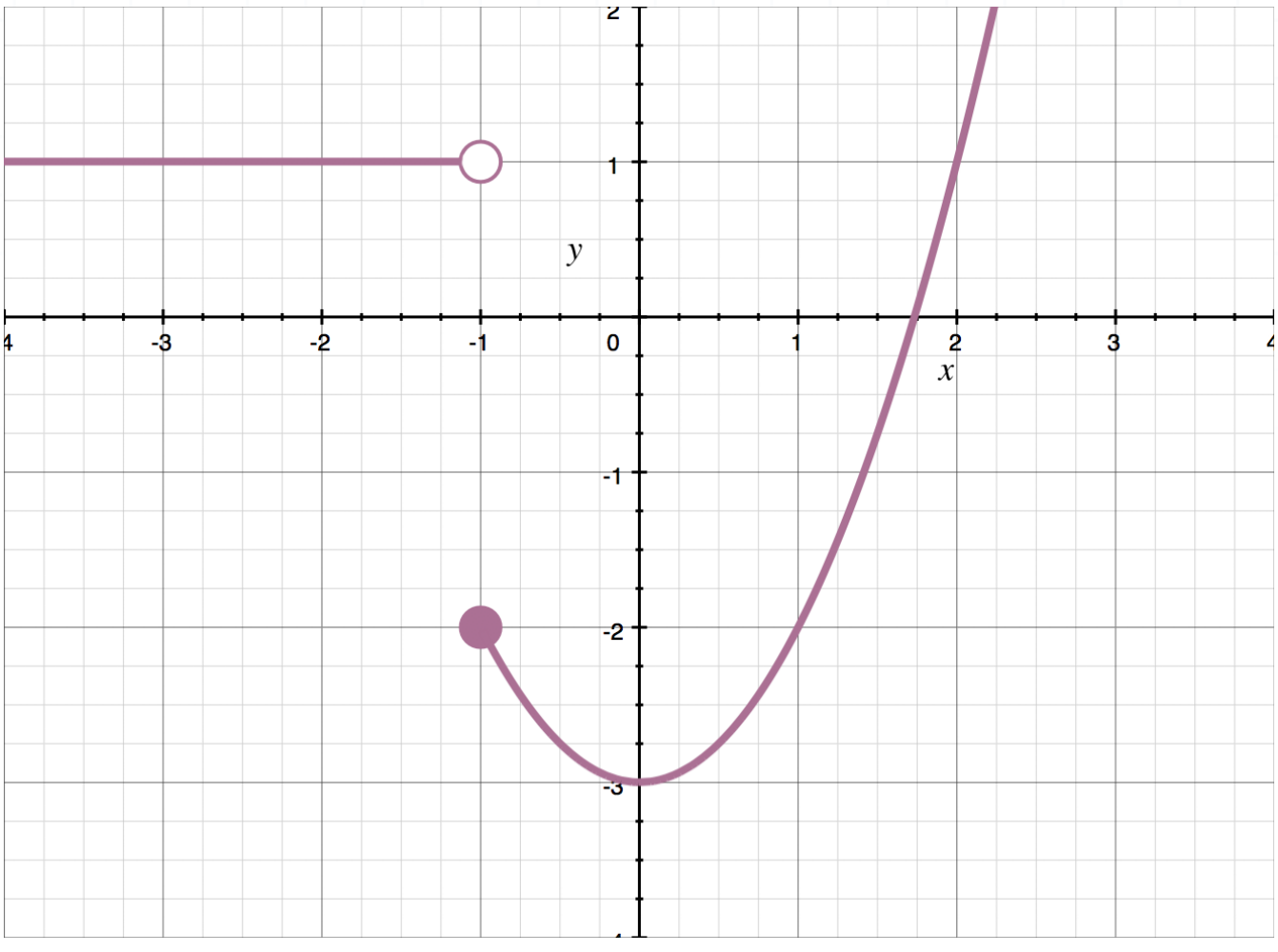
MATH

ONE-SIDED LIMITS

■ 1. What is $\lim_{x \to -7^+} x^2\sqrt{x+7}$?

■ 2. The graph of $f(x)$ is shown below. What does the graph show about the value of $\lim_{x \to -1^+} f(x)$?



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■ 3. The table shows values of $k(x)$. What is $\lim_{x \to -5^-} k(x)$?

x	-5.1	-5.01	-5.001	-5	-4.999	-4.99	-4.9
k(x)	-392.1	-3,812	-38,012	?	37,988	3,788	368.1

■ 4. What is $\lim_{x \to -2^-} h(x)$?

$$h(x) = \begin{cases} -2x - 1 & x < -2 \\ x & -2 \leq x < 2 \\ 2x - 3 & x \geq 2 \end{cases}$$

■ 5. What is $\lim_{x \to 6^+} g(x)$?

$$g(x) = \frac{x^2 + x - 42}{x - 6}$$

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PROVING THAT THE LIMIT DOES NOT EXIST

■ 1. Prove that the limit does not exist.

$$\lim_{x\to 0} \frac{-2|3x|}{3x}$$

■ 2. Prove that the limit does not exist.

$$\lim_{x\to -5} \frac{x^2+7x+9}{x^2-25}$$

■ 3. Prove that $\lim_{x\to 1} f(x)$ does not exist.

$$f(x)=\begin{cases} -3x+2 & x<1 \\ 3x-2 & x\geq 1 \end{cases}$$

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PRECISE DEFINITION OF THE LIMIT

■ 1. Use the precise definition of the limit to prove the value of the limit.

$$\lim_{x \to 4} 5x - 16 = 4$$

■ 2. Use the precise definition of the limit to prove the value of the limit.

$$\lim_{x \to -7} -2x + 15 = 29$$

■ 3. Use the precise definition of the limit to prove the value of the limit.

$$\lim_{x \to 16} \left(\frac{2}{5}x - \frac{17}{5} \right) = 3$$

■ 4. Use the precise definition of the limit to prove the value of the limit.

$$\lim_{x \to 7} \left(\frac{x^2 - 15x + 56}{x - 7} \right) = -1$$

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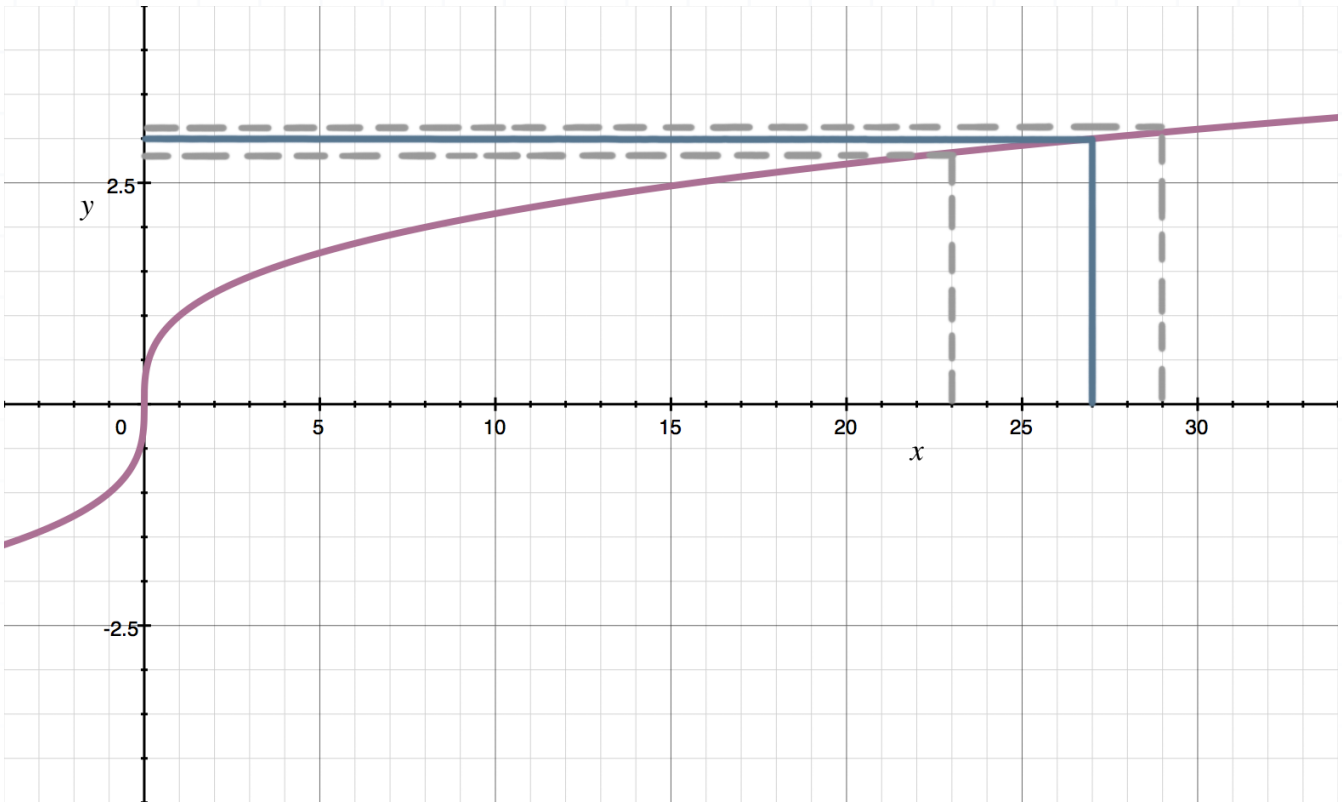
PRECISE DEFINITION OF THE LIMIT, FINDING DELTA

■ 1. Use the graph of $f(x) = \sqrt[3]{x}$ and the precise definition of the limit to find δ, such that if $|x - 27| < \delta$ then $\left|\sqrt[3]{x} - 3\right| < 0.1$.



■ 2. Use the graph of the given function and the precise definition of the limit to find δ, such that if $|x - 4| < \delta$ then $|g(x) - 1| < 0.5$.

$$y = \frac{1}{4}x^2 - x + 1$$

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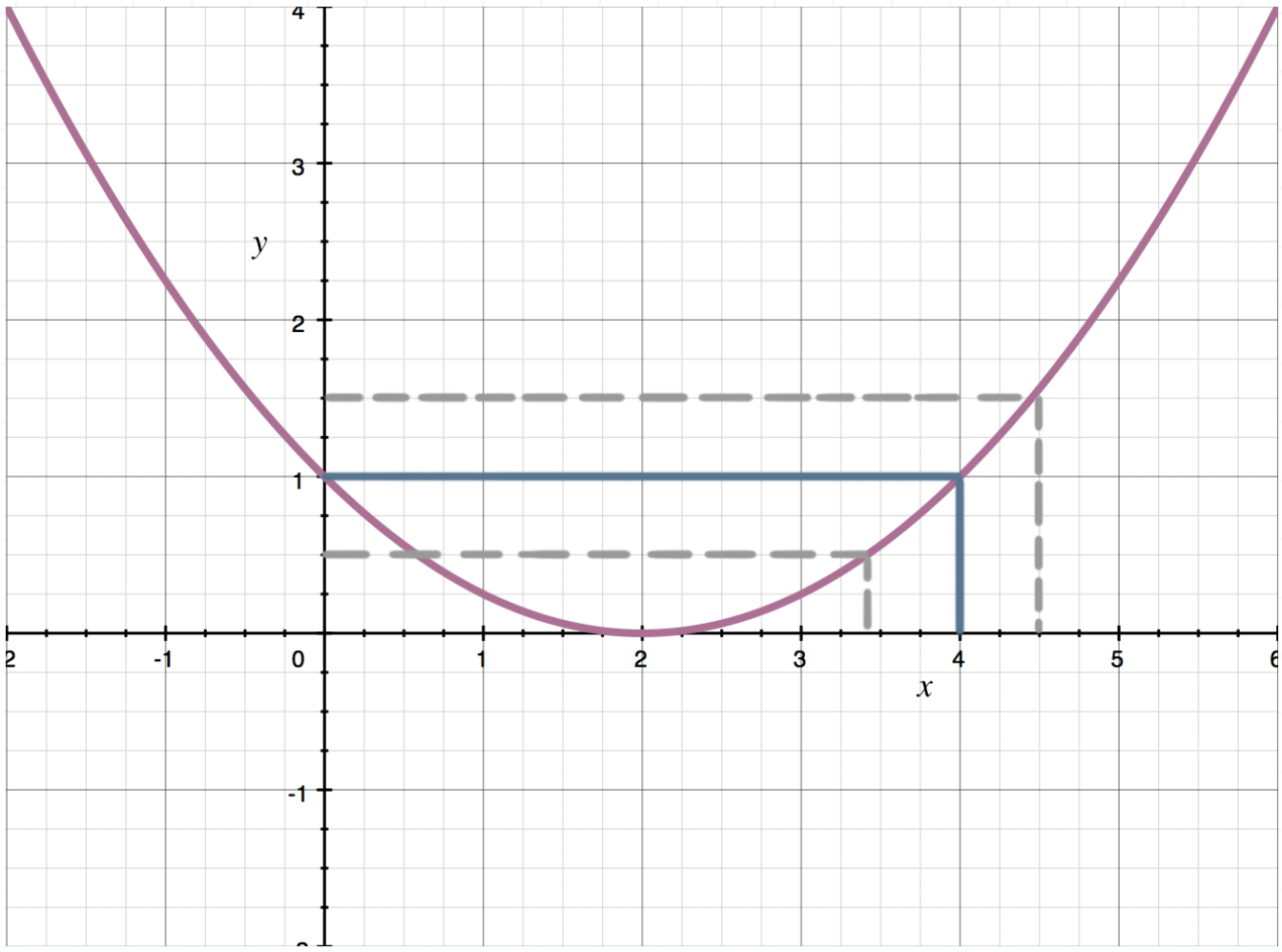

■ 3. Use the graph of the given function and the precise definition of the limit to find δ, such that if $|x-1|<\delta$ then $|h(x)-1.6|<0.3$.

$$h(x)=\frac{3x+5}{7x-2}$$

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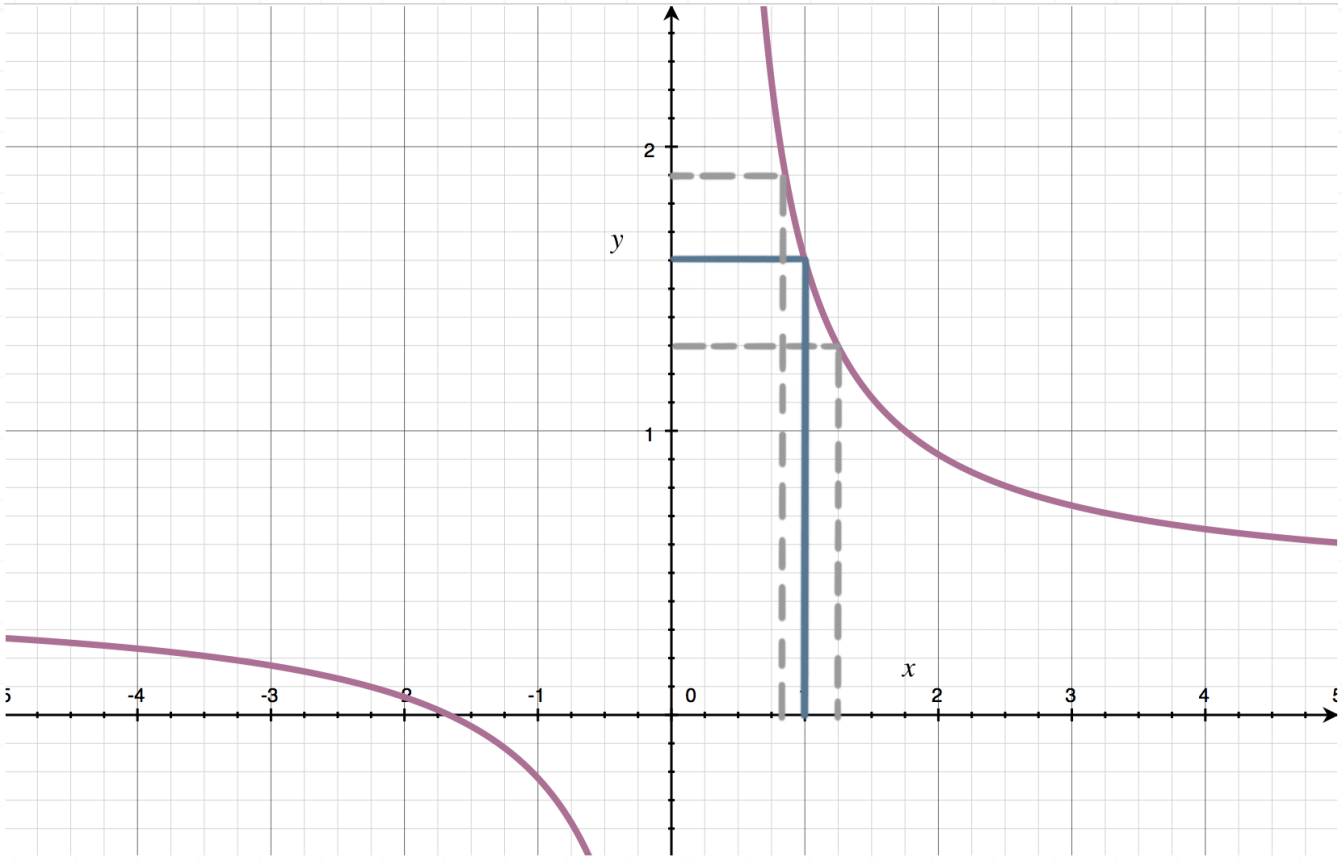

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